

Midnite Mine Superfund Site



Proposed Cleanup Plan

SEPTEMBER 2005

This proposed plan presents the U.S. Environmental Protection Agency's (EPA) preferred alternative for cleaning up the Midnite Mine Superfund Site on the Spokane Indian Reservation in Wellpinit, Washington. EPA is the lead agency for the cleanup project, with the Spokane Tribe participating as a support agency. The purpose of this plan is to inform you of EPA's reasons for recommending the preferred alternative, describe the other cleanup alternatives evaluated, and explain how you can provide input and get involved.

EPA developed this cleanup proposal based on our remedial investigation and feasibility study (RI/FS) of the site and other documents in the Administrative Record. The RI/FS identifies the nature and extent of contamination, risks to human health and the environment, and cleanup alternatives. Important reports related to EPA's RI/FS include the remedial investigation report, the human health risk assessment, the ecological risk assessment, and the feasibility study.

How to Participate

EPA is providing a variety of ways for you to comment on the proposed plan, learn more about the project, and get involved.

Provide Comments to EPA

Your comments will help EPA make final decisions about the cleanup, and they may result in a final cleanup plan that differs from this one. The final cleanup plan (or, "selected remedy") will appear in a document called a Record of Decision, which is expected to be completed in 2006.

Written comments must be postmarked by November 7, 2005. See the last page of this document for instructions on how to submit your comments.

Attend Public Meetings

To help you understand and comment on this proposed plan, EPA will host three public meetings at the Longhouse in Wellpinit. The first two meetings will take place on the same day, Wednesday, October 19. At these meetings, we will discuss the contents of the plan, help you understand the cleanup alternatives, and answer questions. The same information will be presented at both of these meetings, so come to the one that is most convenient for you.

EPA will host the third public meeting on Wednesday, November 2. At this meeting, EPA will listen to public comments and discuss next steps.

Public Meeting Schedule

2005	S	M	Т	W	Т	F	S
OCT	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
NOV	23	24	25	26	27	28	29
	30	31		2			5
		7					12

Wednesday, October 19, 1:00-3:00 pm Wednesday, October 19, 4:00-6:00 pm Wednesday, November 2, 4:00-6:00 pm

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Preferred Alternative

- Remove mine waste (rock, sediment, gravel) from the surface
- Contain the waste in two open pits at the site
- Slope and cover the waste with clean soil
- Cover waste in existing waste-filled pits with clean soil
- Plant native plants on the cover and in areas where waste was removed
- Pump water entering the pits to a water treatment plant at or near the site.
- Treat water to remove contaminants and pipe to nearby stream or river
- Dispose of sludge from the treatment plant in an engineered facility
- · Protect and maintain the soil covers
- Prevent human exposure to contamination in water until cleanup levels are met

How to Participate (continued)

Read Project Documents

EPA has established two places where you can read project documents and view the Administrative Record for the site. Be sure to call ahead for business hours.

Spokane Tribal College and Community Library:

6232 Old School Road, Wellpinit, WA 509-258-9202

EPA Region 10 Records Center:

1200 Sixth Avenue, Seattle, WA 206-553-0115

You can also read documents on our website.

Visit: http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/midnite

Talk with EPA Staff

If you have questions or need additional information, contact:

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Terms Used in the Proposed Plan

Access Restrictions: Ways to keep people out of an area (for example fences, gates, and signs)

Acid Rock Drainage: The result of a reaction between rocks containing sulfide minerals (such as pyrite), air and water. The reaction forms sulfuric acid, which dissolves metals from the rock into the water.

Administrative Record: The collection of information about a Superfund site used by EPA to select a preferred cleanup alternative.

ARARs (applicable or relevant and appropriate requirements): Tribal (or state) and federal environmental statutes that must be met after cleanup or in the process of cleanup at a Superfund site.

Containment Area: An area where waste is contained. At Midnite Mine, this means waste rock above ground or in pits and contained under a soil cover.

Contaminant or Contamination: At Midnite Mine, this means metals or radionuclides in the environment at levels higher than normal because of mining.

Ecological Risk Assessment: A study that estimates the possible effects of contamination on plants and animals if no cleanup is done at a Superfund site.

Engineering Controls: Ways to prevent contact with contamination that involve construction, such as a soil cover or a water treatment plant.

Feasibility Study (FS): The detailed study at a Superfund site that develops and evaluates cleanup alternatives.

Groundwater: Underground water that is often used for drinking water via municipal or private wells.

Human Health Risk Assessment: A study that estimates the likelihood of health problems occurring if no cleanup is done at a Superfund site.

Institutional Controls: Ways to reduce risks from contamination at a Superfund site using legal processes. Institutional controls can include zoning, deed notices, leases and other mechanisms.

Mined Area: The 350-acre area physically disturbed by mining at the Midnite Mine site.

Monitoring: Testing of soil, sediments, air, water, plants, or animals to detect changing conditions at a site.

Ore and Protore: Rock that contains a mineral (for example, gold, silver, uranium) in quantities high enough to be extracted profitably (ore) or slightly below those quantities (protore).

Permeable Reactive Barrier (PRB): Material placed underground which removes contamination from groundwater as it flows through.

Proposed Plan: A summary of site cleanup alternatives and other key information, including EPA's preferred alternative, presented for public comment.

Radiation: Energy released in the form of rays, waves, or particles. At Midnite Mine, radiation results from atomic changes in unstable elements. Radiation of this kind can damage cells and lead to cancer.

Radionuclides: Forms of elements that give off radiation. Examples include radium-226, lead-210, radon-222, uranium-234 and uranium-238.

Radon: A colorless and odorless naturally occurring, radioactive gas.

Reactive Rock: Rock that contains sulfide minerals that can cause acid rock drainage.

Record of Decision: The document that describes EPA's cleanup plan for a site, explains EPA's decision, and provides a response to public comments on the proposed plan.

Remedial Investigation/Feasibility Study (RI/FS): An in-depth study of contamination, human and ecological risks, and potential cleanup alternatives at a Superfund site.

Revegetate: To plant grasses, shrubs, or trees in an area, often to prevent wind and water erosion.

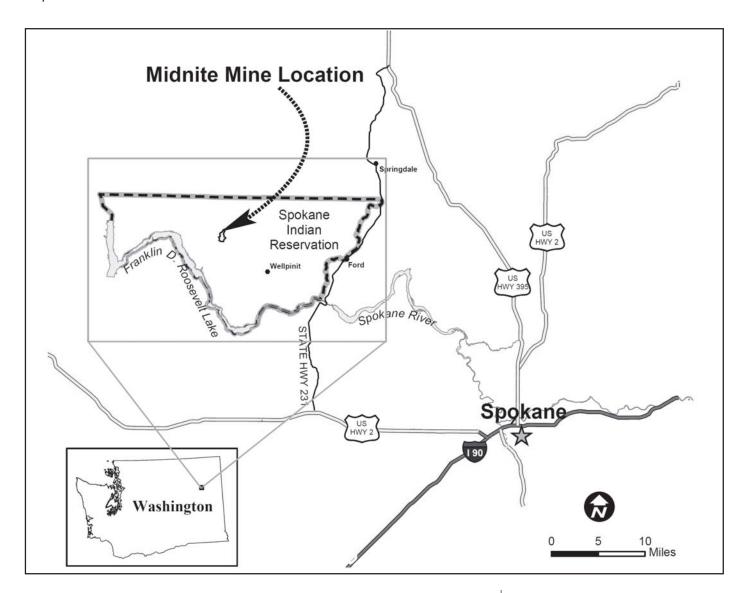
Seep: Water that comes out of the ground, making the ground moist and in some cases flowing (like a spring).

Sludge: Wet solids from water treatment, often containing contaminants removed during treatment.

Superfund: The EPA program that investigates and cleans up the most contaminated hazardous waste sites in the nation (also called CERCLA).

Toxic metals: Metallic elements and compounds that can affect the health of living things. Examples are arsenic, lead, and uranium. Some are necessary in small amounts but become unhealthy at higher levels. Some accumulate in the body or in foods.

Uranium: An element that occurs in nature as a long-lived radioactive metal. Uranium can be mined, concentrated, and used as fuel for power plants or in weapons.



Site Description

The Midnite Mine is an open-pit, hard-rock uranium mine that was active from 1955 to 1981, except for four years in the late 1960s. Mining operations physically disturbed about 350 acres of a 466-acre area leased by the Dawn Mining Company (Dawn) from the Spokane Tribe and tribal allotment owners.

Over 33 million tons of rock were blasted to access uranium ore. The waste was dumped in piles, used to fill mine pits, or spread on the surface. This changed surface water and groundwater flow and resulted in acid rock drainage. About 2.4 million tons of ore and near ore-grade rocks were also stockpiled at the mine in anticipation of later use. Two deeper pits were left open when the price of uranium fell and mining stopped.

Once mining stopped, groundwater, rain, and melted snow began to collect in the pits. Several years later, Dawn began collecting contaminated water seeping from the base of the main waste rock pile. Pumps carry the captured seep water to Pit 3, the larger of the two open pits, for storage. Every year, Dawn pumps water from both open pits to an on-site water treatment plant. After treatment with lime

PROPOSED CLEANUP PLAN – MIDNITE MINE SUPERFUND SITE



and barium chloride, the water quality meets the requirements of an EPA permit and is discharged to a stream. Sludge from the water treatment process is taken to the Dawn Mill in Ford, Washington, for disposal.

Major features of the mined area include:

- · Two large waste rock piles
- Several stockpiles of rock that was once ore-grade or near ore-grade
- Waste rock used for surface grading and for filling early pits
- Two large open pits (Pit 3 and Pit 4)
- · Roads into the pits and around the site
- Office and storage buildings
- Facilities for seep collection, pumping, and water treatment
- Surface water diversion ditches and pipes

Site contaminants include radionuclides (most are radioactive metals) associated with uranium deposits, including radium-226, lead-210, uranium-234 and uranium-238. Non-radioactive metals are also present. High sulfate levels indicate that acid rock drainage is being formed.

Contamination has spread to areas outside the mined area in surface water and sediments, groundwater, and road dust. Most runoff from the mined area flows to three streams (called "drainages"). The drainages meet south of the mine and flow into Blue Creek. Blue Creek travels an additional 3.5 miles to the Spokane River Arm of Lake Roosevelt. Shallow groundwater also flows from the mined area along the three drainages and emerges south of the mined area. Collection and treatment of contaminated water has reduced the amount of contamination entering surface water. However, the drainages and Blue Creek still show ongoing contamination from the mine.

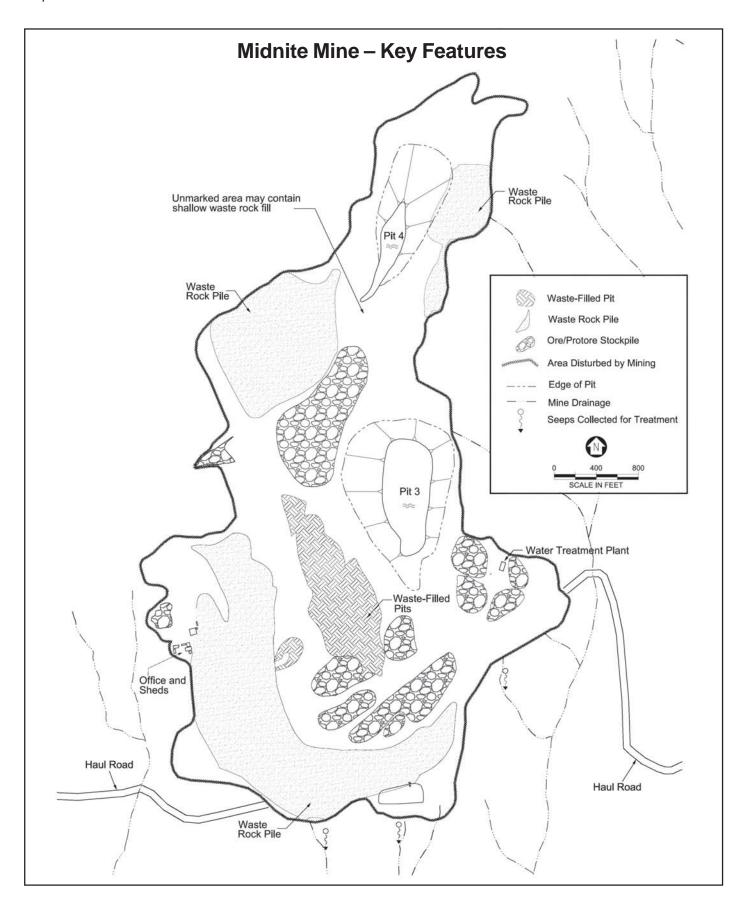
EPA Studies

EPA began its comprehensive study of Midnite Mine in 1999. Building on previous studies, EPA sampled soil, sediment, groundwater and surface water at the mine and in areas where contamination could have been carried by wind or water.

Because the metals and radionuclides associated with Midnite Mine are naturally present in rock, EPA collected samples in nearby areas unaffected by mining. This sampling was used to estimate naturally occurring background levels to which site sampling results could be compared. EPA concluded that areas with levels of metals and radionuclides greater than naturally occurring background levels were affected by mining.

EPA's study showed that the following areas were affected by mining:

- The mined area, where active mining occurred. This area includes open pits; pits filled with waste rock; piles of waste rock, ore and low-grade ore; and areas of waste rock fill
- The mine drainages south of the mined area (including sediments, surface water, and groundwater)



What is risk and how is it calculated?

A Superfund human health risk assessment estimates the baseline risk. This is an estimate of the likelihood of health problems occurring if no cleanup action were taken. To estimate the baseline risk at a site, EPA:

- · Analyzes contamination
- · Estimates exposure
- · Assesses potential health dangers
- · Characterizes site risk

To analyze contamination, EPA measures contaminant levels at the site and considers information from scientific studies about the effects contaminants might have on people (or animals, when human studies are unavailable). Comparisons between site-specific levels and levels reported in past studies help EPA to determine which contaminants are most likely to pose the greatest threat to human health.

To estimate exposure, EPA considers the different ways that people might be exposed to the contaminants, the levels that people might be exposed to, how often and for how long. Using this information, EPA calculates the highest level of human exposure that could reasonably be expected to occur.

To assess potential health dangers, EPA assesses potential cancer and non-cancer health risks. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as a probability; for example, a "1 in 10,000 chance." In other words, for every 10,000 people that could be exposed for a lifetime, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer effects, EPA calculates a "hazard index." Noncancer health effects are not expected to occur if the hazard index is less than 1.

To characterize risk, EPA determines whether site risks are great enough to cause health problems for people at or near the site. The results of the three previous steps are combined, evaluated, and summarized. EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk.

- Gravel haul roads and nearby soils affected by road dust, runoff, or spills (roads at the site were generally surfaced with gravel from the mined area)
- Blue Creek sediments and surface water downstream from the mine

To determine whether the contaminants in these areas posed a risk to human health or the environment, EPA followed a process known as risk assessment.

Cleanup Actions So Far

Dawn Mining Company has taken several measures to control Midnite Mine sources of contamination. These measures include diverting clean runoff, collecting and treating contaminated water, and covering part of the largest waste rock pile with nine inches of soil.

Under an EPA order, Dawn cleaned up ore spilled from haul trucks along the road between the mine and the town of Ford, where the ore was processed at Dawn's mill. Dawn dug up the spilled ore from the roadside and placed it at Midnite Mine. This ore will be included with similar waste in the mined area cleanup.

This proposed plan addresses the final cleanup for the Midnite Mine site, which includes the mined area, mine affected areas, and areas cleaned up along the road to Ford.

Site Risks

To assess risks to human health, EPA worked with the Spokane Tribe to determine how people might be exposed to Midnite Mine contamination. Exposure scenarios were developed for tribal people living in the mined area or just south of it, as well as for people who might live elsewhere but who might rely on Blue Creek, the haul roads, and the mine drainages to support a traditional way of life. No one currently lives at Midnite Mine.

EPA assumed that people living at or next to the mine in the future would use water from private wells or the mine drainages for drinking and traditional sweats. They would also eat meat and plant roots from contaminated areas. In and near their homes at the site, they would be exposed to radiation and radon gas. Tribal people not living at the site were also assumed to eat meat and plants from contaminated areas and to use water from Blue Creek for drinking and traditional sweats.

For people living in the mined area, where radiation levels are higher than background due to waste rock and ore at the surface, the cancer risk from exposure to radiation was well above the threshold that warrants cleanup action (a 1 in 10,000 cancer risk). Such risks were lower for people living south of the mined area, but they were also above the threshold for cleanup. Non-residents relying on the drainages and Blue Creek for traditional purposes had the lowest risks, but subsistence uses of contaminated plants and meat and the use of contaminated water still resulted in risks that warrant cleanup.

EPA's ecological risk assessment looked at the possible effects of contamination on insects, fish, amphibians, plants, birds, and mammals. Ecological risks from contaminants in the mined area and the drainages were high. Ecological risks in Blue Creek were lower because the levels of contamination are less severe than in the mined area and drainages, but the contamination may still pose a risk to stream health.

The risk assessments showed that risks at the site warrant cleanup. EPA developed cleanup alternatives (different ways to reduce risks posed by the site) in its feasibility study. The alternatives consider two primary problems:

- Acid rock drainage. When certain types of rock are exposed to air, the rock surfaces can react with water and oxygen, making the water acidic. The acidic water then dissolves minerals from the rock (such as zinc or uranium), causing them to enter surface water and groundwater. Such "reactive rock" is present at Midnite Mine on the walls of the pits, in rock piled on the surface and in the waste-filled pits, and in gravel used on roads at the site. People, plants, and animals may be exposed to the resulting contamination.
- Radon gas and radiation from rock that contains uranium. Before mining, most of the rock was below the ground, which shielded people from exposure.

Cleanup Goals

EPA's cleanup alternatives were developed to meet five main objectives:

- Reduce human and ecological risks by preventing contact with mine waste
- Reduce radon at the ground surface to acceptable levels
- Reduce radiation at the surface to background levels
- Minimize the movement of contaminants in groundwater, surface water, sediments, and air
- Meet cleanup levels in soil, sediments, surface water, and groundwater

The metals and radionuclides at Midnite Mine occur naturally and, in some cases, even levels in background are higher than limits specified in the Tribe's Hazardous Substances Control Act or calculated based on the risk assessment. In this case, the Tribe's law allows cleanup levels to be established at or very near background levels. Contaminants that contribute most to risk will be cleaned up to background to reduce site risks and to comply with federal and Spokane Tribe laws.

Overview of Alternatives

EPA evaluates cleanup alternatives using nine criteria (see sidebar on page 9).

All of the active cleanup alternatives EPA considered for Midnite Mine include containment of mine waste at the site, management of surface water and ground water, and long-term operation and maintenance of a treatment plant for contaminated water.

- Alternative 1 is "no action." It provides a baseline for comparing other alternatives.
- Alternative 2 is a "limited action" alternative similar to current conditions. It did not meet the threshold criteria of protecting human health and the environment and complying with ARARs.

Your Notes and Questions Here

• Alternatives 3, 4, and 5 meet the threshold criteria. Alternatives 3, 4, and 5 differ most in terms of how and where waste rock would be contained. They also differ in the ways to treat contaminated water. Under each major alternative, two "variants" were developed into detailed alternatives in the feasibility study (Alternatives 3c, 3d, 4d, 4e, 5a, and 5c). The variants are discussed together in the proposed plan for clarity.

EPA's preferred alternative is Alternative 5a. The alternatives range in complexity and cost, but some features are common to all active cleanup alternatives.

Summary of Information Evaluated for Midnite Mine

Contaminants of Concern

- · Radioactive metals
- Radon gas
- · Toxic metals

Alternatives Evaluated

Alternative 1: No action

<u>Alternative 2</u>: Institutional controls, access restrictions and water treatment

<u>Alternative 3</u>: Soil cover over all mine waste, open pits not filled

3c: Water treatment at on-site water treatment plant (WTP)

3d: Water treatment under ground and in open pits

<u>Alternative 4</u>: Soil cover over all mine waste, open pits partly filled

4d: Water treatment under ground in pits 3 and 4

4e: Pit drains and water treatment in WTP

<u>Alternative 5</u>: Soil cover over all mine waste, all waste in pits, pits completely filled

5a: Pumping of water from filled pits to WTP

5c: Previously filled pits excavated, all waste in pits 3 and 4, pit water pumped to WTP

Preferred Alternative

Alternative 5a: Soil cover over mine waste, all waste in pits, all pits completely filled, groundwater removed from waste-filled pits to be treated at WTP

Advantages

- Small waste footprint and few access and use restrictions
- Small volumes of water requiring treatment
- Shorter recovery period for surface water, groundwater, and sediments
- Fewer impacts from hauling material for soil cover

Disadvantages

- Long construction period
- · High capital cost

Cost

Total Cost (in millions of dollars, net present worth, based on a 140 year period and a 3.1% discount rate)

Capital	\$123
Operations and Maintenance	\$29
Total	\$152

Note: Some variants were eliminated previously in the feasibility study. For example, the proposed plan includes Alternative 3c, but not 3a or 3b.

Features Common to Active Cleanup Alternatives

Soil Covers

Alternatives 3, 4, and 5 all include containment of the mine waste beneath a clean soil cover as a major element. The cover would perform many functions, including:

- Eliminating direct exposure to contaminants that contribute most to risk to humans, animals and plants.
- Reducing radon and external radiation exposures to acceptable levels.
- Reducing acid rock drainage.
- Supporting vegetation to reduce erosion.

The thickness of the cover would range from about 2 to 10 feet. For Alternatives 3 and 4, the cover would be thickest over areas of ore and protore because these materials release more radiation and radon. For Alternative 5, ore and protore would be deep in the pits, so the thicker cover is not necessary. The soil cover would be about 240 acres under Alternative 3, and 260 acres under Alternative 4.

Alternative 5 includes a thick plastic liner under the soil cover. The liner would improve the cover's ability to keep radon from coming out and water from getting into the waste. The soil cover would be about 97 acres under Alternative 5a and 80 acres under Alternative 5c.

Areas where waste rock is removed would also require some soil to support vegetation. A detailed cover design will be developed following the selection of a cleanup plan. Nearby sources of soil for cover material will also be further evaluated during the design phase.

Water Treatment and Sludge Disposal

Each of the alternatives (except No Action) includes treatment of contaminated water in an on-site water treatment plant. Alternatives 3d and 4d also include treating contaminated water either underground or in the pit lakes, with additional treatment in the water treatment plant if needed. Dawn's on-site water treatment plant will be used until it is relocated or replaced.

Dawn's water treatment plant uses a chemical process to remove metals and radionuclides from the water. The final cleanup plan will establish new limits for treated water, some more stringent than the current limits. Adjustments to the treatment process may be needed to meet these limits. Specific adjustments will be evaluated during the detailed design.

The process used in the water treatment plant produces a sludge that contains contaminants removed from the water. The sludge must be disposed of in a facility that protects humans and the environment. Currently, the sludge is disposed of at the Dawn mill in Ford, Washington, just outside the reservation. The Dawn mill is being closed and cleaned up under federal and state laws, so an alternative location is needed for sludge disposal. Depending on the scheduling of the mill closure, the new location will be needed by 2010, or earlier.

The costs presented in this proposed plan are based on the assumption that after closure of the Dawn mill the sludge would be disposed of at a low-level radioactive waste disposal facility in Richland, Washington. Most water would be removed from the sludge with a filter press before transport to the facility. Because of the high costs and potential hazards associated with hauling the sludge to an off-site

How Does EPA Choose a Preferred Cleanup Alternative?

EPA uses nine criteria to compare alternatives and select the best cleanup plan. The first two criteria are required. EPA looks for a preferred alternative with a balance among the next five criteria. The preferred alternative may change based on the last two criteria.

- 1. Overall protection of human health and the environment: Will the alternative protect people, plants, and animals at and near the site?
- 2. Compliance with ARARs (applicable or relevant and appropriate requirements): Does the alternative meet all pertinent federal and state statutes, regulations and requirements?
- 3. Long-term effectiveness and permanence: How reliable will the alternative be at long-term protection of human health and the environment? Is contamination likely to present a potential risk in the future?
- 4. Reduction of toxicity, mobility or volume through treatment: Does the alternative reduce the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present?
- 5. Short-term effectiveness: How soon will risks be adequately reduced? Are there short-term hazards to workers, the community or the environment that could occur during the cleanup?
- 6. Implementability: Is the alternative technically and administratively feasible? Are the goods and services (machinery, trucks, disposal facilities, etc.) readily available to complete the work?
- 7. Cost: What is the cost of constructing, operating and maintaining the alternative?
- 8. **Tribal acceptance:** Does the Spokane Tribe agree with EPA's recommendations? What are their preferences and concerns?
- 9. Community acceptance: What suggestions or changes do community members offer during the comment period? What are their preferences and concerns?

Your Notes and Questions Here

location, the feasibility study also evaluated sludge disposal at Midnite Mine in an engineered facility. The Spokane Tribe's Hazardous Substances Control Act currently restricts on-site disposal of the water treatment plant sludge, however, and feasibility study cost estimates for a facility at or near the site may not reflect costs the Tribe may impose. The Tribe is investigating the technical and cost implications of such a facility.

It may be possible to add a step to the water treatment process to remove uranium from the water (using a process known as ion exchange) before the sludge forms. The sludge would then contain less radioactivity and could be disposed of at a less costly facility for non-radioactive waste. Water treatment technologies and sludge disposal plans will be refined during detailed design.

The Spokane Tribe's water quality standards include a sulfate standard that is not achieved by the current water treatment method. Sulfate is not believed to cause permanent health effects, but at high levels it may cause short-term problems (diarrhea) for people who are not used to the water. This may be of concern for people drinking water from Blue Creek, particularly babies, sick people, or elders. Treating water to meet this standard greatly increases the volume of sludge produced by the treatment process, which increases the costs for water treatment and sludge disposal.

EPA is working with the Tribe on options to provide environmental and human health protection for sulfate. One option is to pipe the treated water from Midnite Mine to the Spokane River, where the sulfate would be diluted and people and animals would not be exposed to sulfate at levels of concern. This option is assumed for EPA's preferred alternative and would require modifications to the Tribe's standards to allow a mixing zone. Another option is to wait until the cleanup has reduced the flow and improved the quality of water requiring treatment before assessing the need for changes to the water treatment process. These options may require an interim action waiver of the Tribe's sulfate standard.

Gravel Haul Roads

Alternatives 3, 4, and 5 include actions to address the gravel haul roads and nearby contaminated soil. Actions for the haul roads include paving the roads to cover the gravel or excavating the roads. During construction of the remedy, roads used would be paved, resurfaced, or otherwise controlled to prevent dust and contaminant transport.

Pit and Stream Sediments

Alternatives 3, 4, and 5 include actions to address sediments in the pits, mine drainages and parts of Blue Creek. Actions include barriers to keep contaminated sediments from moving down the drainages, excavation of contaminated sediment, if necessary, and allowing areas with low levels of contamination to naturally decrease to background levels over time. To prevent recontamination of the streams as a result of construction in the mined area, sediments would not be excavated until after most of the mined area construction work was done. Sediments that required excavation would be added to the mine waste containment areas. Sampling would determine whether sediments should be removed or could recover naturally.

Design and Construction

The design phase starts after EPA selects a cleanup plan. The design phase may include sampling and testing to make sure volumes of waste rock, sources of cover material, water treatment processes and other details are clear enough for detailed construction planning.

All of the active cleanup alternatives require extensive construction. An estimate of time needed for construction is included with each alternative. During construction, surface water controls will be needed to minimize the impacts of moving clean soil and waste rock. Since construction will take longer than one season for all active alternatives, water must be collected and treated during construction. The open pits would be used for water storage during construction of Alternatives 2 and 3. Alternatives 4 and 5, which move waste rock into the open pits, would require a place to store and treat contaminated water until the soil covers are complete.

Access Restrictions, Institutional Controls and Long-term Plans

For all of the alternatives, steps to prevent damage to the soil covers and long-term maintenance of the cover systems are included. Long-term treatment of water and disposal of water treatment plant sludge are also included.

In areas where waste is contained under a soil cover, access restrictions such as fencing and boulders are needed to keep vehicles from damaging the surface. EPA will also work with the Spokane Tribe and the Bureau of Indian Affairs (BIA) to prevent future construction in containment areas. This requires the use of institutional controls (ordinances, deed notices, and other legal tools to control land use).

Beyond the containment areas, water and sediment affected by the mine may not reach cleanup goals for years or even decades after the construction of containment systems. To prevent humans from being exposed to contamination in these areas, EPA will work with the Spokane Tribe and BIA on institutional controls to prevent the use of groundwater and to develop signs and health advisories.

Sampling will be needed after cleanup to assess changes in water quality over time. EPA will review the cleanup at Midnite Mine every five years following the Record of Decision to determine whether it continues to protect human health and the environment.

Cost Estimates

The feasibility study includes a detailed cost estimate for each alternative. The estimates include costs for sludge disposal on site and off site. They also show costs for cover construction materials from areas closer to and further from the site. The proposed plan shows costs using the higher end of the range, because a nearby source of construction material may not be available and disposal at the site is unlikely.

Capital costs are for initial construction, while costs for operations and maintenance (O&M) include ongoing costs, such as water treatment and sludge disposal, and periodic costs (inspections, replacements, repairs).

EPA develops cost estimates using "present worth" calculations. A present worth estimate gives a single cost in "today's money" that can be compared against that for other alternatives with different combinations of capital and O&M costs. A time period and a discount rate (roughly, the rate at which the amount of money available to pay for O&M costs is expected to change due to returns from investment minus inflation) are applied to future costs.

This proposed plan shows cost estimates based on present worth calculations for 140 years of O&M costs and a 3.1% discount rate. Estimates based on a 7% discount rate and 30 year time period, as well as factors that show the effect of different periods and discount rates, can be reviewed in the feasibility study.

Your Notes and Questions Here

Description of Alternatives

Alternative 1

No Action

Description. Alternative 1 involves taking no action to protect human health and the environment. Collection and treatment of contaminated water would stop.

Evaluation. Alternative 1 would not meet the threshold criteria. There would be no reduction in risk within the mined area, and contaminated seepage and runoff water would be released to the steams without treatment. As a result, risks would increase for humans and wildlife that consume or are exposed to surface water and sediments in the mine drainages and Blue Creek. Currently, those risks are already higher than target risk ranges.

Alternative 2

Institutional Controls, Access Restrictions and Water Treatment

Description. Alternative 2 represents current conditions, with the addition of institutional controls and access restrictions to limit people's exposure to contamination. Use of the water treatment plant would continue, and a filter press would be added to remove water from the sludge before disposal. Access to the mined area would be limited by a fence about four miles long. No other actions, such as regrading and covering, would be taken to prevent direct exposure to the mine waste or contact between the mine waste and water. Use of surface water and groundwater for drinking or sweat lodges would be limited through use restrictions, such as prohibitions on groundwater well installation. The area of surface water use restrictions would include all of Blue Creek below its confluence with the Eastern Drainage.

The estimated cost of Alternative 2 is \$118 million:

Capital	\$2.4 million
Operations and Maintenance	\$116 million
Total Cost	\$118 million

Evaluation. Alternative 2 could potentially provide adequate protection for people. However, this protection is provided primarily through institutional controls and access restrictions, which are not as reliable as engineering controls (for example, containment of mine waste). Fencing would do little to protect wildlife, as it does not keep small animals or birds from contacting pit walls, pit water, and mine waste. Because Alternative 2 does not reduce acid rock drainage, downstream water quality would not improve. For the same reason, the estimated long-term costs for treating water and disposing of the treatment sludge are high.

Alternative 3

Soil Cover Over All Mine Waste, Open Pits Not Filled

Alternative 3c: Water Treatment at On-Site Water Treatment Plant

Alternative 3d: Water Treatment Under Ground and in Open Pits

Description. Alternative 3 variants include containment of mine waste above ground near the center of the site. Waste rock would be moved and sloped to improve drainage and reduce surface slopes. The containment system includes a thick cover over areas containing ore and low grade ore and a thin cover over other areas containing waste rock. To protect the containment systems and reduce human health risks, institutional controls would prohibit residential use and physical barriers would discourage vehicle access to cover areas. The restricted use area would be about 310 acres.

The open pits would remain open, and fences would prevent access by humans and large animals. Under Alternative 3c. Pit 3 would continue to store contaminated water prior to treatment. The contaminated water would be treated in the water treatment plant, which would be upgraded to meet limits for metals and radionuclides. Under Alternative 3d, contaminated seepage would be treated using permeable reactive barriers (materials placed underground that treat groundwater as it passes through). Water that collects in the open pits would be treated by mixing in organic and inorganic amendments. Further studies would be needed to determine the exact nature and effectiveness of the inplace treatment methods.

Under Alternative 3c, poor-quality groundwater in the waste-filled pits would be collected for treatment using wells constructed in the waste backfill. Under Alternative 3d, that groundwater would be treated using permeable reactive barriers south of the mined area.

Both alternatives address contaminated groundwater that currently bypasses the

seep collection system. Under Alternative 3c, groundwater would be collected and treated in the water treatment plant. Under Alternative 3d, it would be treated using permeable reactive barriers south of the mined area.

Restrictions on the use of surface water and groundwater within the mined area would be needed at first, as described under Alternative 2. However, EPA expects that water quality would improve over time due to the cleanup actions. As a result, the restrictions may no longer be needed outside of the waste containment area after a recovery period that could last from one to several decades. Use restrictions within the containment area would be needed for the foreseeable future.

The estimated cost of Alternative 3c is \$152 million, and the estimated cost of Alternative 3d is \$218 million:

	Alt. 3c	Alt. 3d
Capital	\$71	\$103
Operations and Maintenance	\$81	\$115
Total Cost	\$152	\$218

Costs in millions

The cost of Alternative 3d is high because of the cost and volume of materials used in the permeable reactive barriers.

Evaluation. Alternatives 3c and 3d would protect human health and the environment and comply with environmental requirements. Compared to Alternative 2, protection of human health is provided more through engineering controls (waste containment), with reduced reliance on access and use restrictions. The long-term water treatment and sludge disposal costs under Alternative 3c are lower compared to Alternative 2, but are higher than Alternative 5. Alternative 3d would need further studies to determine the effectiveness and cost of water treatment in the open pits and permeable reactive barriers.

Alternative 4

Soil Cover Over All Mine Waste, Open Pits Partly Filled

Alternative 4d - Water Treatment underground in Pits 3 and 4

Alternative 4e - Pit Drains and Water Treatment in the Treatment Plant

Description. Alternatives 4d and 4e include placement of the ore stockpiles into Pit 3 and part of the waste rock from the nearest waste rock pile into Pit 4. The pits would be partially backfilled, which would prevent the exposure of humans and animals such as cows, deer, and elk to contaminated water in the pits. Water entering the waste-filled pit would now be underground or would be pumped out. Waste rock that was not put in the pits would be sloped and covered as under Alternative 3. Institutional and access controls would be used in the mined area, as under Alternative 3. The size of the restricted use area would be about 310 acres.

Because mine waste would be placed in the open pits below the groundwater level, Alternatives 4d and 4e would include ways to capture and remove water that enters the pits or to prevent conditions that cause poor water quality. Alternative 4d includes in place treatment of water that enters the waste-filled pits. Non-toxic chemicals would be added to the pits along with the waste rock to change the contamination into chemical forms that have low solubility in water. This would keep contamination from moving out of the pit. Alternative 4e includes a drainage system which would allow water that enters the pits to flow to the pit bottom and drain out through a borehole drilled in the bedrock. The water would emerge from the borehole south of the mined area and be piped to the water treatment plant.

Under both Alternatives 4d and 4e, poorquality groundwater from existing

waste-filled pits would be collected where it comes to the surface in seeps south of the mined area. Contaminated seepage could be pumped to the pits and treated in place (Alternative 4d) or pumped directly to the water treatment plant (Alternative 4e). Both alternatives include collection and treatment of contaminated groundwater that is not currently captured by Dawn.

Restrictions on the use of surface water and groundwater outside the waste containment area would be needed at first. Restrictions may no longer be needed in areas outside of the mined area after a recovery period that may last from one to several decades. Use restrictions within the mined area would be needed for the foreseeable future.

The estimated cost of Alternative 4d is \$177 million, and the estimated cost of Alternative 4e is \$167 million:

	Alt. 4d	Alt. 4e
Capital	\$114	\$86
Operations and Maintenance	\$63	\$81
Total Cost	\$177	\$167

Costs in millions

Evaluation. The evaluation of the Alternative 4 variants is similar to that of the Alternative 3 variants. A major difference is that the Alternative 4 variants eliminate the possibility of exposure to contaminated water in Pit 3 and Pit 4. Similar to Alternative 3d, studies would be needed to better evaluate the effectiveness and cost of treating the groundwater in place.



Alternative 5¹

Soil Cover Over All Mine Waste - Preferred All Waste In Pits, Pits Completely Filled

Alternative 5a - Pumping of Water from Filled Pits to WTP

Alternative 5c - Previously Filled Pits Excavated, All Waste in Pits 3 and 4, Pit Water Pumped to WTP

Description. Alternative 5 variants include containment of all the mine waste within existing pits. Pits 3 and 4 would be filled up to or above the top of the pit walls. Under Alternative 5a, all mine waste except that in the existing wastefilled pits would be excavated and placed in Pit 3 and Pit 4. Under Alternative 5c, initially proposed by the Tribe, all mine waste including waste in the existing waste-filled pits would be excavated and placed in Pits 3 and 4. An opening would be made in the excavated pit for water to drain out. Institutional and access controls would be used in the waste containment areas, as under Alternative 3; however, the size of the restricted use area would be reduced to 97 acres under Alternative 5a and 80 acres under Alternative 5c.

Under both Alternatives 5a and 5c, waste rock would be removed from the drainages, restoring the original land surface except where pits were excavated. Surface water and groundwater use restrictions would be needed initially outside the waste containment areas; how-

ever, these restrictions may not be needed after one to several decades. Use restrictions within the waste containment areas would be needed for the foreseeable future.

The estimated cost of Alternative 5a is \$152 million and the estimated cost of Alternative 5c is \$154 million.

	Alt. 5a	Alt. 5c
Capital	\$123	\$125
Operations and Maintenance	\$29	\$29
Total Cost	\$152	\$154

Costs in millions

Evaluation. Alternatives 5a and 5c provide the greatest level of isolation of the mine waste from water. This is expected to result in the lowest volumes of water treatment and sludge production, and the shortest duration of surface water and groundwater use restrictions outside the waste containment areas. These alternatives also require the smallest land area for waste containment. Alternative 5c would need the least land area because mine waste would be removed from the existing waste-filled pits. However, there would be additional costs for removing and creating disposal capacity for this material. Both alternatives would have longer construction times and capital costs than the other alternatives, but long-term operations and maintenance costs would be lower.

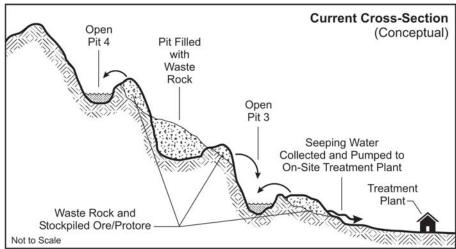


ferred preferred Alternative - 5a1

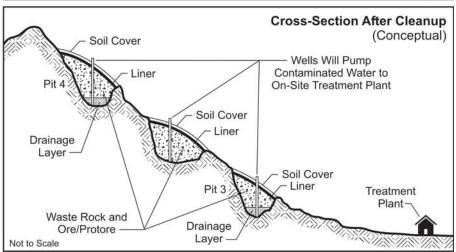
Alternative 5a is EPA's preferred alternative. The primary elements of the Preferred Alternative include:

- Excavation and consolidation of mine waste in Pits 3 and 4; this includes ore and protore, waste rock, haul road gravel and soil, and contaminated sediment. It does not include waste rock from the existing waste-filled pits.
- Placement of a drainage layer and a thick plastic liner at the bottom of Pit 3 and Pit 4 prior to filling the pits with the mine waste. The layer would extend part way up the pit walls to channel groundwater entering the pits to the bottom.

¹Some elements of Alternative 5a as presented in this proposed plan have been modified from Alternative 5a as evaluated in the FS.



Cross Section of Cleanup Using EPA's Preferred Alternative



Information About the Alternatives

	Alternative 2b	Alternative 3c	Alternative 3d	Alternative 4d	Alternative 4e	Alternative 5a (preferred)	Alternative 5c
Total Cost (millions) Present worth estimate, based 3.1% discount rate, 140 yr perio		\$152	\$218	\$177	\$167	\$152	\$154
Capital Cost (millions)	\$2.4	\$71	\$103	\$114	\$86	\$123	\$125
O&M Cost (millions)	\$116	\$81	\$115	\$63	\$81	\$29	\$29
Areas of restricted access (in acres)	350	310	310	310	310	97	80
Sludge to be disposed of (in cubic feet per year)	12,000	5,800	1,300	2,900	5,800	1,000	1,000
Water needing treatment in water treatment plant (in millions of gallons)	80	38	16	up to 37	38	6.5	10
Cover construction materials needed (in cubic yards)	None	1 - 2 million	1 - 2 million	1 - 2 million	1 - 2 million	600 thousand	400 thousand
Earthmoving on site (in cubic yards)	None	~5,000,000	~5,000,000	~5,000,000	~5,000,000	~17,000,000	~19,000,000
Time to construct (in years)	None	2 - 3	2 - 3	4 - 5	4 - 5	6 - 8	7 - 9

Preferred Alternative - 5a (continued)

- Installation of wells in Pits 3 and 4; water would be pumped from the drainage layer beneath the liner and from waste rock above the liner. Water would be pumped to the water treatment plant.
- Installation of wells in the existing waste-filled pits. Water would be pumped to the water treatment plant.
- Covering the waste in Pits 3 and 4 and the existing waste-filled pits with a plastic liner and about three feet of soil; the cover would be planted with native plants.
- Construction of a storm water management system to divert clean water away from pits containing waste.
- Replacement of the water treatment plant at a new location. Temporary treatment units would be used before and during remedy construction to empty water from the pits and keep them from refilling during several years of construction.
- Potential construction of a pipeline to carry treated water from the water treatment plant to the Spokane Arm of Lake Roosevelt (see discussion under Water Treatment and Sludge Disposal).
- Excavation of contaminated material from the gravel haul roads and nearby soil; the gravel and soil would be added to Pit 3 or Pit 4.

- Excavation of contaminated sediments; the sediments would be added to Pit 3 or Pit 4.
- Institutional controls on construction in waste containment areas and on water use where cleanup levels are not met, including health advisories as appropriate.
- Access restrictions to prevent damage to soil covers and to reduce risks.
- Long-term monitoring and 5-year reviews.

The Preferred Alternative would place all the mine waste within the existing open pits, except materials in the existing waste-filled pits. The more radioactive materials (ore and protore) would be placed in the pit under tens of feet of waste rock, to reduce radon levels at the surface. Any mine waste that could not be contained within Pit 3 and Pit 4 would be mounded on top of the existing waste-filled pits to enhance surface water runoff. A cover consisting of a liner and approximately three feet of soil would be placed over the waste in Pits 3 and 4 and the existing waste-filled pits, to keep surface water from getting in and radon gas from getting out. A layer of suitable soil would be placed over areas cleared of mine waste, as needed, and planted to prevent erosion.

Drainage systems in Pit 3 and Pit 4 would keep water away from the waste rock and channel it to the bottom, where it could be removed by pumping wells. First, a water collection sump would be excavated in the pit floor. A five-foot thick layer of rock that doesn't form acid rock drainage would be placed on the bottom and up the sides of the pit to direct groundwater to the sump. A plastic liner would be placed over the drainage layer before waste rock was added. The liner would reduce contact between water and waste rock and keep contaminants and fine soil in the mine waste from clogging and contaminating the drainage layer, particularly during construction.

Water that collects in the drainage layer and in waste rock above the liners in Pits 3 and 4 would be pumped out. The existing waste-filled pits would not have a drainage layer, but wells would be used to pump contaminated water from the waste-filled pits. Water pumped from all of the pits would be piped to the water treatment plant. About 6.5 million gallons per year would require treatment once the pits were filled and covered. This would generate an estimated 40 tons (1,000 cubic feet) of sludge per year. Sludge would be safely disposed of in an engineered facility. It is estimated that construction of the preferred alternative may require up to seven years.

Basis for EPA's Preference

EPA prefers Alternative 5a because, compared to the other alternatives that protect human health and the environment and comply with ARARs, Alternative 5a provides the best balance of tradeoffs among the criteria discussed below.

Long-term Effectiveness

Alternative 5a, like Alternative 5c, provides more long-term effectiveness compared to Alternatives 3 and 4. All of the alternatives, including Alternative 5a, require long-term monitoring and maintenance to be effective in the long term. However, compared to Alternatives 3 and 4, Alternative 5a is expected to greatly reduce the generation of acid rock drainage by isolating mine wastes from air and water in the open pits. A liner and soil cover will reduce (and may eliminate) contact between water and waste in the waste-filled pit area. Removing mine waste from the surface and containing it in the open pits under a liner and soil cover will reduce water accumulating in the pits. A drainage layer and wells will allow water entering the pits to be removed and treated.

Alternative 5a relies less on institutional controls. As with the other alternatives, institutional controls and access restrictions are needed for Alternative 5a, but compared to Alternatives 3 and 4 they may be needed in a smaller area and for a shorter duration. As long as the containment is maintained, animals and people will not come into contact with waste, and radon and radiation at the surface will meet cleanup levels. Outside the containment area, institutional controls may be needed for a shorter period than other alternatives.

tion.

Short-term Effectiveness

Although short-term impacts from construction (such as noise and some contaminated runoff) may be unavoidable, this would be the case with all active cleanup alternatives. Careful design and use of controls during construction will be needed to minimize these impacts. Less material is needed to cover the mine waste for Alternative 5a than for Alternatives 3 and 4, and this reduces short-term impacts from excavating and transporting the material. Community impacts are reduced due to a smaller volume of cover material to haul to the site and reduced volumes of sludge. Construction will take longer for the preferred alternative than for most other alternatives, but once the waste has been contained, additional groundwater contamination is not expected and groundwater will begin to recover.

Cost

The capital cost of Alternative 5a is higher than for Alternatives 3 and 4, because it includes moving more waste material. However, reducing acid rock drainage reduces the long-term costs for treating water and disposing of sludge. As a result, the overall costs for Alternative 5a are as low as or lower than for all other alternatives.

Based on the information available at this time, EPA and the Spokane Tribe believe the preferred alternative would protect human health and the environment, would comply with ARARs, would be cost-effective, and would use permanent solutions and alternative treatment to the maximum extent practicable. Because no principal threat wastes are present, the remedy meets the statutory preference for the selection of a remedy that involves treatment as a principal element. The preferred alternative can change in response to public comment or new informa-

Implementability

and

Reduction of Toxicity, Mobility, or Volume through Treatment

The alternatives do not differ greatly for these two criteria. However, the preferred alternative requires permanent restrictions on land use for a smaller area than Alternatives 3 and 4. This may make institutional controls and access restrictions easier to maintain.

Tribal Acceptance

The Spokane Tribe currently supports Alternative 5c and EPA's preferred alternative, Alternative 5a.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period and will be described in the Record of Decision for the site.

Submit Your Comments

EPA values your comments on the proposed plan. You can submit comments using this form, write them on a separate sheet of paper, or send them via email. You can also comment at a public meeting (see front page). If you have questions about how to comment, contact Ellie Hale at 800-424-4372 or 206-553-1215. Written comments must be postmarked by November 7, 2005.

Ellie Hale, EPA Project Manager U.S. EPA Region 10 1200 Sixth Avenue Seattle, WA 98101-1128 hale.ellie@epa.gov

Comments submitted by:	
Name	
Address	
City	
State	. Zip
Email	

Comments:	